

A college experience

for high school juniors and

seniors interested in careers

in ENGINEERING and

COMPUTER SCIENCE.

July 10 - August 11, 1989



1989 Secondary School Program

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Calendar

Fee Schedule

5 week session July 10 - August 11, 1989

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Dormitory check-in
July 8 & 9, 1989 9am — 5pm

Orientation
July 9, 7pm

Classes begin
July 10

Course changes
July 10

Classes end
August 10

Examinations
August 11

Dormitories close
August 12

Application	\$ 15.00
Program fee	100.00
Tuition	450.00
(includes two 3-credit courses & one optional free audit course)	

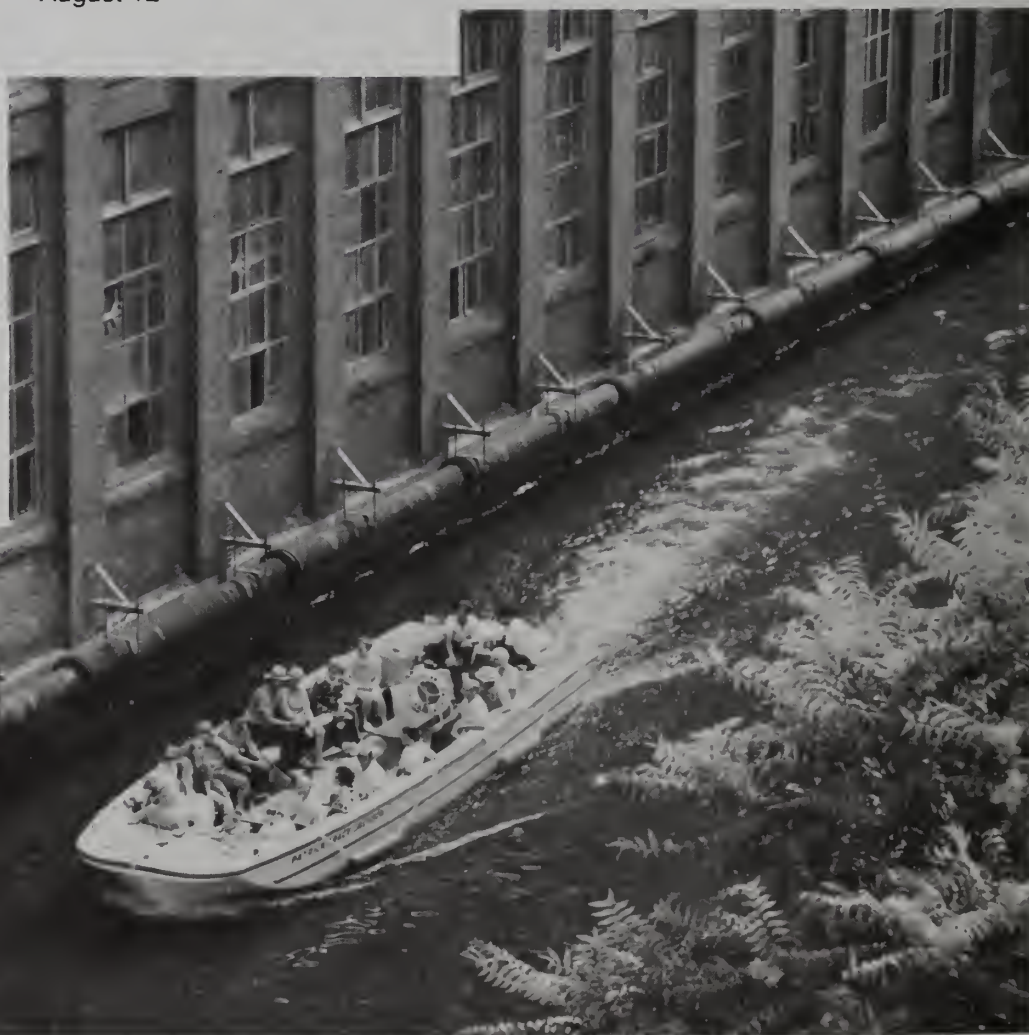
Room	300.00*
Board	420.00

Total	\$1285.00
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* Subject to change with notice
Note: Upon acceptance to the program, students must submit a non-refundable deposit of \$100.00 (to be credited towards the cost of the program). This amount will be forfeited if the student cancels his or her participation in the program.

For further information or additional copies of this brochure, please contact:

John Hurtado
Program Coordinator
Secondary School Program
University of Lowell
Continuing Education
One University Avenue
Lowell, MA 01854
(508) 452-5000 x 2221



Program Description

Eligibility

LD
333
1132
266

1989 Sum. SSP

The five-week program includes college level coursework, tours of high technology and manufacturing companies, and visits with professionals in high tech firms. It is open to academically accomplished high school juniors and seniors whose career interests involve computer sciences or any of the various engineering disciplines. Students will have an opportunity to take two college level courses for credit and explore the corporate work setting. Each course normally meets four days per week (Monday through Thursday). Laboratory time is additional. Students will be encouraged to participate in extracurricular activities occurring on and off campus.

All applicants must be at least 16 years old by the start of the program. Prospective students will be reviewed based on the following profile: a minimum score of 1000+ (combined verbal and mathematics) on the SAT (or PSAT) and rank in the top fourth of the student's class. A "B" average or better must be confirmed by an official copy of the applicant's high school transcript which the student must request. Two recommendations, one from the guidance counselor or principal and one from a science or math teacher, must be forwarded. Finally, a completed application (all forms enclosed in this brochure) which includes biographical information and two essays must be submitted.

Upon receipt and review of all materials (application, transcript, scores, and two recommendations), admission will be granted on a rolling basis by a committee. Each accepted student will be asked to choose two courses (and a third for a free audit, if desired) from the selected list of introductory and mid-level courses included in this brochure. A copy of the University of Lowell Summer School Bulletin with additional courses will also be mailed to accepted students. All course selections will be subject to review and approval.

Note: Acceptance to this summer program does not constitute admission to the University as a regular student. University of Lowell is an Equal Opportunity/Affirmative Action institution and does not discriminate in employment or access to programs or services on the basis of race, sex, color, national origin, religion, handicap, or veteran's status, and is in compliance with Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973.





A number of events and activities are planned for non-classroom hours. They are intended to provide participants with a full range of experiences, both academic and social, similar to those encountered in college. These will include a series of lectures and discussions led by representatives of engineering and computer firms. Field trips to local industrial settings and tours of campus laboratories will allow the participants to view actual work environments. Finally, a career day with representatives from industry, the faculty and the student body will provide an opportunity for students to explore careers in these areas.

On Campus

On campus, there will be a variety of activities in coordination with other residential program participants. The University's various athletic and academic facilities will be available for use by students. They include an indoor pool, tennis courts, a running track, a gymnasium, boathouse (with rowing and sailing instruction), libraries, and computer laboratories.

Greater Boston

Students will have access to the social and cultural activities in the greater Lowell and Boston areas. They will have an opportunity to explore the numerous historical sites which exist within Lowell and the Merrimack Valley region. Just as visits to the Route 128 and 495 high technology belt will acquaint participants with cutting edge developments in industry, these tours will introduce students to the earlier technology which converted the United States from an agricultural to an industrial leader.

Special Programs

Other Special Programs on campus during the program include the Theater and Film Institute and the Writing Program, as well as regular University of Lowell Summer School day and evening sessions. The Theater and Film Institute will be run in close cooperation with the University of Lowell English Department and the Merrimack Repertory Theatre, which will oversee the artistic and practical components of the program. Courses in theater history, acting, directing, playwriting, and film will be offered, and a variety of visiting artists from the world of drama and film will be on campus to interact with students and give public presentations.

The Writing Program will offer a broad range of credit courses in expository, creative, and professional writing which will combine classroom instruction with extensive practice in writing. Visiting writers will work with students and make public appearances. Also of interest will be the annual Kerouac Arts Festival (July 13-16), a celebration of the arts featuring a variety of nationally prominent writers and artists.



The University of Lowell is the largest public educator of engineers and computer scientists in New England. In the academic year 1987-8, the Engineering College and the Computer Science department awarded a total of 622 baccalaureate and 153 graduate degrees. With University of Lowell alumni in such roles as president, director, manager, and supervisor at large and small technological companies, these programs have attained a national reputation for producing leaders in these fields.

The College of Engineering offers degrees in Chemical, Civil, Electrical, Mechanical, Nuclear, and Plastics Engineering. Its laboratories are among the finest and most complete in the nation. The faculty is nationally and internationally recognized with most having substantial industry experience to supplement their academic achievements.

Regional and national corporations employ University of Lowell trained engineers and rely upon the University to offer continuing education programs. All engineering programs are approved by the Accreditation Board for Engineering and Technology and other professional standards committees.

The Computer Science Department, part of the College of Pure and Applied Science, offers degrees in Artificial Intelligence, Compiler Design, Computer Architecture and Networks, Data Base Design, Graphics, Knowledge Engineering, Operating Systems, Robotics and Machine Vision, and Software Engineering. Its resources include laboratories equipped to encourage hands-on learning and research. Faculty members and the Graphics Research Laboratory have been active in the development of national and international standards for many years.

The bachelor of science program in Computer Science is based on the curriculum recommendations of the Association for Computer Machinery and the Institute of Electrical and Electronics Engineers as well as on advice from leaders in the local high tech community. This program has been meticulously designed to meet the current and future demands of expanding computer technology. Graduates of the program are prepared for a wide array of positions including systems engineers, technical sales, software, marketing specialists, systems analysts, and consultants.

The University is located in the heart of the state's booming high technology region. Numerous small start-up companies and some of the world's largest high-tech corporations such as Digital, Apollo, Wang, GTE, Data General, Stone and Webster, Sanders, and Bolt Beranek and Newman are headquartered in the area. The proximity of the University to these and other companies offers unparalleled access to contemporary and future technologies for faculty and students.

The city of Lowell, located about a half-hour north of Boston on the banks of the Merrimack River, is the birthplace of the American Industrial Revolution. From cotton mills to computer chips, the entrepreneurial spirit that fueled the revolution is thriving today. The demand for labor in 19th century industrial Lowell attracted large numbers of immigrants who began arriving in the late 1800's. Participants in this program will find Lowell a living museum of science and society.

Culture and history abound in Lowell. The National and State Park Services offer a variety of exhibits and programs within the city. Park Service staff lead regular walking tours of restored mill buildings, barge tours of the city's intricate canal system, and trolley rides through the old city. The University of Lowell Center for Performing and Visual Arts and the Merrimack Repertory Theatre present lively schedules of plays, concerts, exhibits, and lectures. In the summer of 1989, Lowell will again host the National Folk Festival — a vibrant display of dance, crafts, food, concerts, and fireworks, that extends throughout the city. Also in the summer, the University of Lowell offers free boating on the Merrimack River for participants in summer programs.

Course Descriptions:

Math and Computer Science

(This is a partial listing of courses.)

90.113 College Algebra

Intended for students whose background in basic algebra is current, the objective of this course is to provide students with the problem solving and computational techniques needed for further coursework and in their occupation. Topics covered include: quadratic equations, functions, transformations, inequalities, systems of equations and the exponential and logarithmic functions. Prerequisite: Fundamentals of Algebra or satisfactory score on the Math Placement Exam given first week of class. 3 credits.

91.101 Computing I (Pascal)

Overview of computer organization. The Pascal language, data types and their representation, arithmetic and logic operations, simple I/O control structures, subprograms, arrays, records, and introduction to files. Problem solving via stepwise refinement, good programming style, documentation, and testing. 4 credits.

91.102 Computing II (Pascal)

Recursion and dynamic data structures in Pascal. String processing. Searching and sorting methods. Hash coding. Linear storage allocation (e.g., stacks, queues) and linked allocation (e.g., linked lists, trees). Problem solving via stepwise refinement, good programming style, documentation and testing. Prerequisite: Pascal I or equivalent. 4 credits.

92.115 College Trigonometry

Angles and their measure, the trigonometric functions, solving triangles, law of sines, law of cosines, circular functions and their graphs, trigonometric identities. Prerequisite: College Algebra. 3 credits.

92.202 Microcomputers and Applications Software

An introduction to the processing of information by microcomputers. Topics include computer logic, memory, input/output, and use of applications software including spreadsheets, word processors, graphics and data bases. No prerequisite. 3 credits.

92.131 Calculus I

Analytic geometry including lines, circles and conic sections; functions, limits, derivatives, integrals, curve sketching, areas. 4 credits.

92.132 Calculus II

Differentiation and integration of trigonometric, exponential, logarithmic, and hyperbolic functions. Parametric equations, polar coordinates, arc length, methods of integration, applications. Prerequisite: Calculus I or equivalent. 4 credits.

92.231 Calculus III

Infinite series, vectors and analytic geometry in space, partial derivatives, multiple integrals. Prerequisite: Calculus II or equivalent. 4 credits.

92.263 FORTRAN Programming

Programming principles of FORTRAN including input-output, arithmetic and control statements, arrays, functions and subroutines. Structures programming will be emphasized. Students will process several problems. Prerequisite: Algebra. 3 credits.

92.265 Pascal Programming

An introduction to computer programming including elements of algorithm design and data structures using the Pascal language. Topics covered include: algorithm development by stepwise refinement, language control structures, functions and procedures, the standard data types, scalar data types, and an introduction to structured types. The student will process a number of programs on the University computer. 3 credits.

92.365 COBOL Programming I

Programming principles of COBOL, the Common Business Oriented Language: identification, environment, data, and procedures divisions, introduction to compilation procedures and diagnostic processing. Programming of basic applications, such as inventory and accounting problems. 3 credits.

92.219 BASIC Programming

Programming in BASIC, including nested loops, subscripted variables, string manipulation, subroutines and advanced programming techniques. Prerequisite: Algebra and working knowledge of some other programming language. 3 credits.

92.267 "C" Programming

In this course, students are introduced to the techniques of programming in "C". The language syntax, semantics, its applications, and the portable library are covered. Prerequisite: Pascal. 3 credits.

92.383 Intro to Statistics

Sets and probability laws, random variables, mathematical expectations, measure of central tendency and variance, discrete and continuous probability distribution, sampling theory, tests of hypothesis, regression and correlation. 3 credits.

92.321 Discrete Structures I

Propositional logic, combinatorics, methods of proof, mathematical systems, algebra of sets, matrix algebra, relations, and functions. Recursion and generating functions. Applications to Pascal and graph theory. 3 credits.

92.360 Intro to Data Structures

Basic concepts of data. Linear lists, strings, arrays, and orthogonal lists, trees and graphs, storage systems and structures, storage allocation and collection, multilinked structures, symbol tables, searching and sorting (ordering) techniques. Prerequisite: Pascal programming. 3 credits.

92.455 Assembly Language Programming I

Absolute machine language coding and the symbolic programming language; the basic computer instructions including arithmetic, input/output, logic control operations, and data manipulation. The coding of practice problems on a high-speed digital computer. Prerequisite: FORTRAN or Pascal. 3 credits.

Engineering

25.101 Intro to Design and Graphics

Introduces engineering design as the method for solving open-ended problems. Techniques in engineering graphics are developed and applied as the media of communications in design. Thought processes associated with the development of creative and innovative design ideas are discussed and applied. The subjects of experimental and analytical modeling are introduced and related to the design process. 2 credits.

24.205 Intro to Energy Engineering

Overview of the feasibility, environmental impact, and economics of various energy producing systems. 3 credits.

25.127 Computer Programming for Engineers

Teaches students to use a time-shared computer system to solve engineering problems. FORTRAN-77 is the programming language used. The steps of program development are stressed, including problem definition and analysis, algorithm design, coding, debugging, and verification of results. Students are required to run a substantial number of programs. They are taught to use a text editor and interface with the system throughout their program preparation, compilation, linking, and program verification phases. 3 credits.

16.211 Fundamentals of Electricity

An introduction to the basic principles of electricity, including the concepts of voltage, current resistance, inductance, capacitance, energy, and power; Ohm's and Kirchhoff's Laws; Thevenin's and Norton's Theorems; RC and RL transient analysis; the concept of average and root mean square values; and the analysis of steady state alternating current circuits including complex impedance and phasor notation. Prerequisite: Calculus II or equivalent. 3 credits.

Science

84.111 General Chemistry I

A one semester survey of the chemistry principles which govern the structure of matter, the quantitative and qualitative aspects of compounds and chemical reactions, properties of matter, periodicity, solution chemistry including acid-base chemistry, reaction rates, equilibrium, and oxidation-reduction. Taken with: 84.113. 3 credits.

84.113 General Chemistry Laboratory I

This laboratory course is the corequisite of General Chemistry I. Experiments emphasize the principles covered in General Chemistry I and the techniques, skills and reasoning employed in the scientific method. 1 credit.

87.103 The Earth and Its Environment I

An investigation of the interaction between science and man's understanding and use of the earth and its environment. Origin of the Universe and solar system, the dynamic earth, earth resources, astronomical and geologic time. 3 credits.

95.141 Physics I

Vectors, kinematics in one and two dimensions, dynamics, work and energy, conservation of energy, center of mass, momentum, conservation of momentum, collisions, statics, rotational kinematics, rotational dynamics and angular momentum. Taken with: 96.141. 3 credits.

96.141 Basic Experiments in Physics

A set of experiments designed to manifest the principles and concepts of Physics I. 1 credit.

Liberal Arts and Area Core Courses

25.203 Technology and Human Values I

This is a team-taught course about interrelationship of technology and human values. It begins with an exploration of the Industrial Revolution in Lowell, followed by an examination of topics drawn from such areas as agriculture, Third World development, population control, energy and natural resources, household technology, and transportation. Unifying themes are the values associated with science and technology, the role and responsibility of the scientist and technologist, and the question of whether scientific and technological development should be and can be controlled. 3 credits.

59.215 Computers in Society

An exploration of the relationship between computers and the society in which they operate: the nature of computers and their historical development; possibilities and problems arising from computer use in such areas of contemporary life as education, the military, and business; the issues of freedom vs. control of the individual. 3 credits.

59.309 The Engineer in Society

The class will examine from an interdisciplinary perspective the role of the engineer in society. How has this role changed? What can be expected for the future? The engineering personality, engineers in industry, ethics and engineering are some of the subjects to be covered. The format of the class will encourage discussion of the issues. Each student will prepare a substantial report on a topic of personal interest. 3 credits.

64.201 Economics I

A study of the principles of production and exchange. An introduction to demand, supply, pricing and output under alternative market structures. Derived demand and resource markets are introduced. 3 credits.

64.202 Economics II

A study of the principles governing the level of national income and employment. Examination of the commercial banking system, monetary and fiscal policy, the international economy, and alternative economic systems. 3 credits.

Since participation in all events is essential to maximize the college experience, with many activities occurring after regular class hours, program participants are encouraged to live on campus. However, a limited number of commuters will be accepted into the program. Housing will be in one of the University's residence halls on the north campus where all classes will be held. Students will be housed with one or more roommates depending upon room configuration. No single occupancy rooms exist. Within this building, other facilities include lounges (with televisions), self-service laundries, and activity rooms.

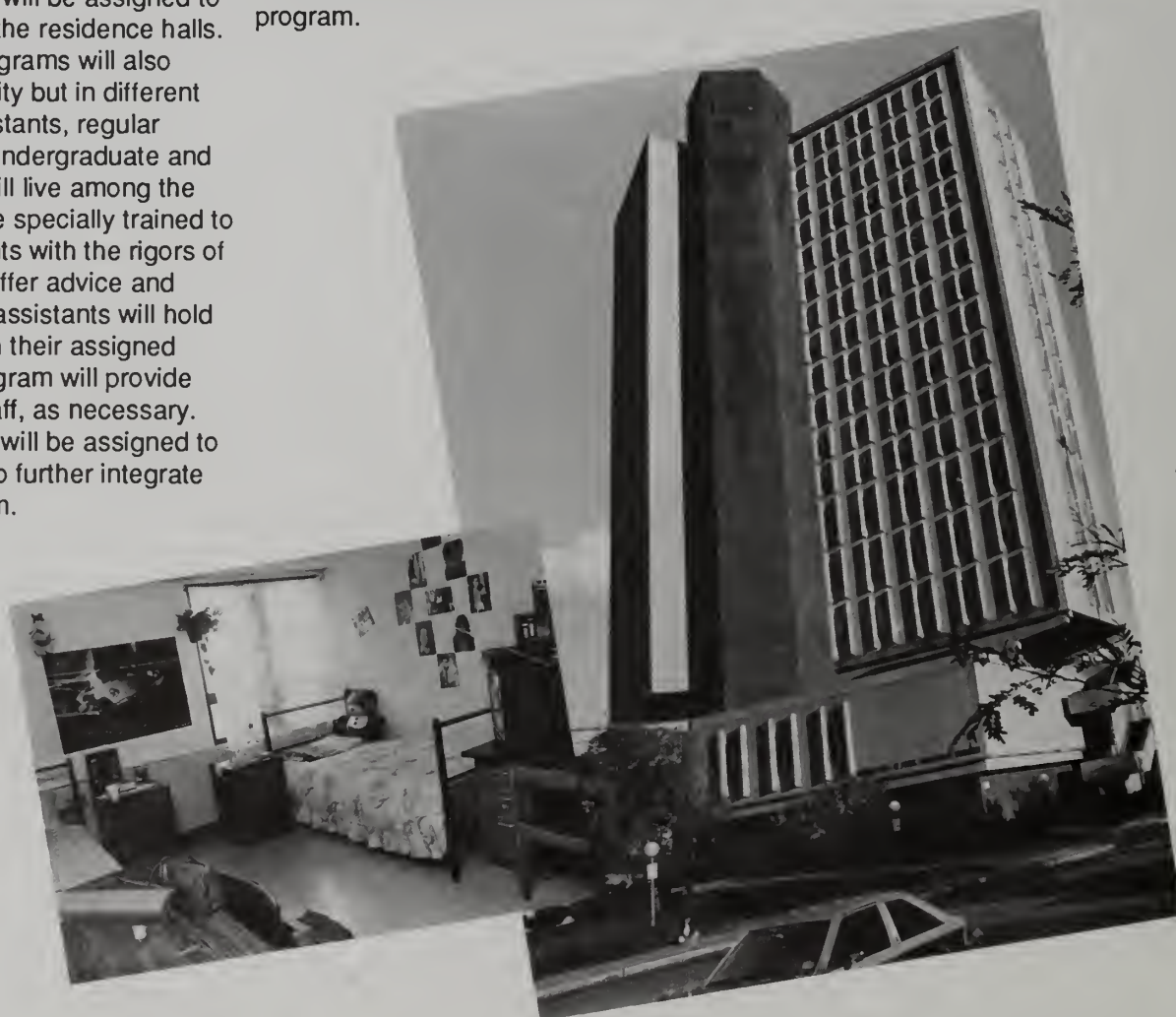
Program participants will be assigned to specific floors within the residence halls. Students in other programs will also reside within the facility but in different areas. Resident assistants, regular University of Lowell undergraduate and graduate students, will live among the participants. They are specially trained to help incoming students with the rigors of college life and can offer advice and friendship. Resident assistants will hold regular meetings with their assigned students and the program will provide additional support staff, as necessary. Commuting students will be assigned to a resident assistant to further integrate them into the program.

Participation in the board program is mandatory for residents and partial programs are available to commuters. We encourage commuters to take advantage of the board program. The rate of \$420.00 includes three meals per day Monday through Friday and brunch and dinner on weekends. Meals will be served at a dining room near the residence hall. Dining room hours are scheduled to accommodate class and program schedules.

Conduct

Participants will be required to follow program and University rules distributed in the admissions packet. Violation of these rules may result in disciplinary action and potential expulsion from the program.

ULowell does not have a formal medical facility on-campus; any injured or ill students would be transported to one of three local hospitals. In order to facilitate access to proper medical treatment, students must supply evidence of medical insurance and complete the parental consent waiver supplied in the admission packet.



University of Lowell 1989 Secondary School Program Application Form

Applicant _____

Social Security Number _____ Birthdate _____

Current Address _____

Street _____ City _____

State _____ Zip Code _____ Phone: _____

Permanent Address _____

Street _____ City _____

State _____ Zip Code _____ Phone: _____

School You Currently Attend _____

_____ Phone: _____

Graduation Year 19 _____ Grade Point Average _____

Class Rank _____ (approximate, if necessary)

Test Scores: (Circle Type) PSAT / SAT Date(s) _____

Verbal _____ Math _____ Combined _____

Recommenders 1) _____

(Guidance or Principal)

2) _____

(Teacher)

I wish to be a: (check one) ☐ dormitory resident ☐ commuter

For Foreign Students Only: Country of citizenship? _____

Do you need an I-20 visa eligibility form? yes _____ no _____ If no, what is your visa status while attending the program? _____

For All Students: Essay Questions

Limiting yourself to the reverse side of this sheet, please answer **two** of the following four questions which you think will best portray you and your interests to our Admissions Committee.

1) Describe a science or computer project you participated in or completed which was particularly rewarding to you.

2) What do you think will be the most important responsibilities of a scientist/technologist in the year 2000?

3) Which of your courses this year do you find the most challenging? Why?

4) Why do you wish to attend University of Lowell's Secondary School Program in Engineering and Computer Science?

Please type or print your essays on this side.

University of Lowell Secondary School Program Reference Form

To the Student:

We require two references. Please print your name and address below. Then copy this form and give one to a teacher, and one to a guidance counselor or principal with a stamped envelope addressed to Secondary School Program, University of Lowell, Continuing Education, 1 University Avenue, Lowell MA 01854.

Student's Name _____
Last First Middle

School Name _____ CEEB Code Number _____

School Address _____
Street City State Zip Code

Under the terms of the Family Educational Rights and Privacy Act I ☐ waive ☐ do not waive any right of access to this reference form.

Student's Signature _____ Date _____

To the Teacher, Guidance Counselor, or Principal:

Please describe this student's academic accomplishments and give your estimate of his/her ability to deal effectively with college level work and environment. Include any factors (motivational, social, intellectual, family- or health-related) that may affect this student's adjustment and performance in University of Lowell's summer program:

Please check appropriate levels below to compare the student with his or her classmates.

Below Average Average Above Average Excellent (top 10%)

Mathematical ability	_____	_____	_____	_____
Verbal ability	_____	_____	_____	_____
Social maturity	_____	_____	_____	_____

1. How long have you known this applicant? _____

2. In what course(s) have you taught him or her? _____
(if applicable)

3. What grade level did this student earn in your course(s)? _____
(if applicable)

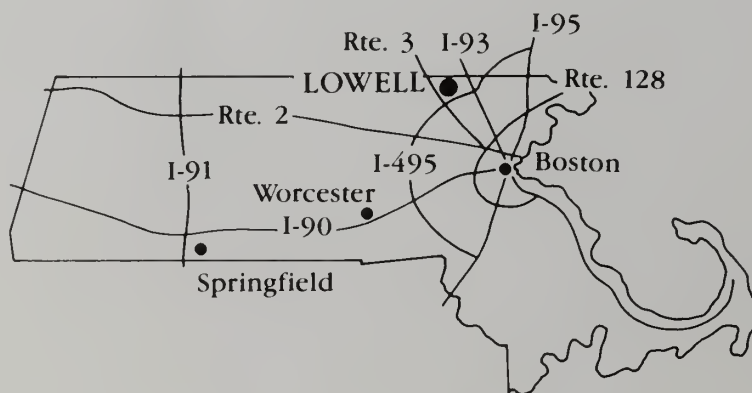
Signature _____ Date _____

Please print name _____
First Last School Telephone Number _____

University of Lowell
Continuing Education
One University Avenue
Lowell, MA 01854

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Lowell is located about 30 miles north of Downtown Boston.

From the Merrimack Valley: Take Route 495 South to the Lowell Connector.

From Boston: Take Route 93 North to Route 495 South. Stay on 495 until you reach the Lowell Connector exit.

From Route 128: Take Route 3 North to the Lowell Connector.

From New Hampshire: Take Route 3 South to Route 495 North exit to Lowell Connector.

From the Lowell Connector: Take exit 5N, Thorndike Street. At end of Thorndike go right and then go left over the bridge. North Campus is straight ahead after the lights on the bridge over the Merrimack River.